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臺灣產細櫛角蟲科回顧 (鞘翅目：丸甲總科)

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摘要: 本研究回顧臺灣產細櫛角蟲科 (Callirhipidae Emden, 1924) 種類並提供科級中文俗名之建議和種級檢索表，此外，本文亦探討蘭嶼產細櫛角蟲屬 (*Callirhipis*) 物種的學名錯誤鑑定和該物種正模式標籤資訊疑題。

關鍵詞: 細櫛角蟲、檢索表、中文俗名、錯誤鑑定、臺灣物種相

前言

細櫛角蟲科 (Callirhipidae) 又稱為櫛角蟲科，中國大陸地區稱為扇角甲，幼蟲以腐朽木材為食，成蟲主要為夜行性且具有趨光性，日間偶爾可觀察到停棲於死亡的樹幹的個體 (Lawrence, 2005; Hájek, 2011) ，本科隸屬於丸甲總科 (Byrrhoidea)，是鞘翅目的一個小科，全球共計10屬 (含亞屬階元) 175種 (含亞種階元)，其中臺灣已知兩屬四種 (Hájek, 2011)。細櫛角蟲為中型的甲蟲，體長介於 9–27 mm，體態修長，體長約為體寬的 2.7–3.3 倍，雄蟲的觸角發達，觸角小節 3–11 具細長的分枝，而雌蟲的觸角小節 3–11 則呈梳狀 (Lawrence, 2005; Hájek, 2011)。

本科模式屬細櫛角蟲屬 (*Callirhipis*) 由 Latreille 建立於 1829 年 (Latreille, 1829) ，隨後被置於蟬寄甲科 (Rhipiceridae) (Latreille, 1834)，Emden (1924b) 將細櫛角蟲處理為蟬寄甲科下的一個族級分類群，然而 Forbes (1926) 基於後翅翅脈特徵將細櫛角蟲類 (細櫛角蟲屬 (*Callirhipis*) 和 鋸齒櫛角蟲屬 (*Zenoa*)) 轉移到角胸泥蟲科 (Eulichadidae)，Böving & Craighead (1931) 以幼生期特徵重新檢視細櫛角蟲與蟬寄甲間的關係且將兩個類群處理為不同的科別，然而獨立成科的分類處理在當時未獲普遍接受，直至 Crowson (1950, 1955) 再次重新提出細櫛角蟲與蟬寄甲應被視為不同科群，近年的分子親緣研究也證實兩個類群分屬不同的總科 (Zhang et al., 2018)。

近年來愛好自然觀察的民眾增加且網路社群的發達，越來越多的自然觀察愛好者利用網路社群分享物種觀察知識或詢問物種鑑定，進而帶動物種鑑定和中文俗名上的需求，然而在本科除了科中文名有使用上的分歧外，坊間書籍和網路資訊有關大細櫛角蟲的資料存在著學名錯誤拼寫問題，本文除概述性回顧臺灣產的細櫛角蟲科物種相，對於本科的中文俗名給予建議，以及釐清大細櫛角蟲的學名誤植狀況和探討其正模式產地問題外，另提供臺灣產物種的中文俗名和雄性種級檢索表。

材料與方法

本研究檢查之標本分別存放於：九州大學綜合博物館 (Kyushu University Museum, Fukuoka, Japan)；國立自然科學博物館 (National Museum of Natural Science, Taichung, Taiwan)；何彬宏私人收藏 (BHPC: Bin-Hong Ho’s personnal collection, Taichung)；吳之皓私人收藏 (CHC: Chih-Hao Wu's private collection, Taitung)；胡芳碩私人收藏 (FSHC: Fang-Shuo Hu's private collection, Yilan)；王惟正私人收藏 (UOC: Uitsiann Ong's private collection, Tainan)；作者私人收藏 (YHC: Y. Hsiao’s private collection, Taichung)。物種鑑定基於模式標本照片、原始描述文獻和 Satô (1995)，模式標本照片來自國立自然科學博物館－重建臺灣失落的昆蟲模式標本計畫 (Digitization of Historic Museum Collections of Taiwan Deposited in Foreign Countries, 2011)，標本相片以 Nikon COOLPIX P310 數位相機拍攝，長度單位為毫米 (mm)，不同標籤以雙斜線 // 分隔表示。

結果

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臺灣產細櫛角蟲科 (Callirhipidae) 名錄

***Callirhipis* (*Callirhipis*) *formosana* Pic, 1912 蓬萊細櫛角蟲**

(圖一 A, 圖二 A, D)

Callirrhipis formosana Pic, 1912: 5.
Callirrhipis formosanus: Miwa, 1933: 9.

標本檢查：TAIWAN: 1 ♂, K. Botan Garden, Kentine, Pintung, 22–25. V. 1989, Light Trap, C.-S. Lin leg. // NMNS ENT 446-527 (NMNS); 2 ♂♂, Nanshanchi, Jenai, Nantou, 17–19. V. 1999, UV Light, W.-T. Yang leg. // NMNS ENT 3221-472; 3221-51 (NMNS); 2 ♂♂, 1 ♀, Zhongzheng high school, Beitou Dist., Taipei City, 9. VII. 2014, B.-H. Ho leg. (BHPC); 1 ♂, Mingchih, Daton Township, Yilan Co., 14. VI. 2015, Y.-H. Ho leg. (BHPC); 1 ♂, Sheding Park, Hengchun Township, Pingtung Co., 23. VI. 2016, B.-H. Ho leg. (BHPC); 1 ♂, Luodong, 24.673112, 121.781905, Yilan Co., 10. VI. 2018, By hand, F.-S. Hu leg. (FSHC)。

***Callirhipis* (*Callirhipis*) *kojimai* Nakane, 1996 大細櫛角蟲 (小島氏細櫛角蟲)**

(圖一 B–C, 圖二 B, E)

Callirhipis kojimai Nakane, 1996: 132.

標本檢查：TAIWAN: 4 ♂♂, Orchid island [=Lanyu], 22–31. VIII. 1988, Light-trap, C.-S. Lin leg. // NMNS ENT 63-725; NMNS ENT 63-725; 63-739; 63-751; 63-759 (NMNS); 1 ♂, Lighthouse, Lanyu Is., 10. X. 1990, H.-Y. Wang leg. // 1282-33089 (NMNS); 1 ♂, Yehyin, Lanyu, Taitung, 15–16. VI. 1995, By hand, M.-L. Chan & W.-T. Yang leg. // NMNS ENT 2007-225 (NMNS); 1 ♂, Yonghsing Farn, Lanyu, Taitung, 20. IV. 1997, Sweeping Net, M.-M. Yang leg. // NMNS ENT 2667-2514 (NMNS); 1 ♂, Tienho A Reservoir, Lanyu, Taitung, 20. IV. 1997, Sweeping Net, M.-M. Yang leg. // NMNS ENT 2667-2574 (NMNS); 2 ♂♂, Hsiaotienchih, Lanyu, Taitung, 23–24. IV. 1997, UV Light, W.-T. Yang leg. // NMNS ENT 2667-212; 2667-279 (NMNS); 1 ♂, Chung Ai Chlao, Lanyu, Taitung, 24–25. IV. 1997, UV Light, W.-T. Yang leg. // NMNS ENT 2667-2389 (NMNS); 1 ♂, Yonghsingnungcnuang, Lanyu, Taitung, 24–25. IV. 1997, UV Light, W.-T. Yang leg. // NMNS ENT 2667-3178 (NMNS); 1 ♂, Szudaugou, Lanyu, Taitung, 25–26. IV. 1997, UV Light, M.-L. Chan leg. // NMNS ENT 2667-637 (NMNS); 1 ♀, Langtou Village, Lanyu, Taitung, 26. IV. 1997, By hand, B. Brown & V. Berezovskiy leg. // NMNS ENT 2667-2904 (NMNS); 1 ♂, Yonghsing, Lanyu, Taitung, 17–19. VIII. 1998, Sweeping net, H.-T. Shih & M.-L. Chang leg. // NMNS ENT 3209-1024 (NMNS); 2 ♂♂, Yonghsing NO. 1, Lanyu, Taitung, 1–20. IX. 1998, Malaise Trap, H.-T. Shih leg. // NMNS ENT 3209-1133; 3209-1157 (NMNS); 1 ♂, Yonghsing NO. 1, Lanyu, Taitung, 22. IX. 1998, Malaise Trap, H.-T. Shih leg. // NMNS ENT 3209-1386 (NMNS); 1 ♂, Yonghsing NO. 4, Lanyu, Taitung, 24–27. X. 1999, Malaise Trap, M.-F. Lou & W.-L. Lin leg. // NMNS ENT 2326-683 (NMNS)。

***Callirhipis* (*Ennometidium*) *horni* (Emden, 1924) 霍氏恩細櫛角蟲**

(圖一 D, 圖二 C)

Ennometes horni Emden, 1924a: 30
Callirhipis (*Ennometidium*) *horni*: Emden, 1929: 118

標本檢查：TAIWAN: 1 ♂, Lienhuachih, Nantou, 15–16. VII. 1991, UV lite trap, C.-S. Lin leg. // NMNS ENT 1144-356; 3 ♂♂, Lienhuachih, Nantou, 12. VII. 1992, UV Light, W.-T. Yang leg. // 1440-223; 1440-277; 1440-357 (NMNS)。

***Simianus melanocephalus* (Emden, 1924) 橙細櫛角蟲 (橙櫛角蟲)**

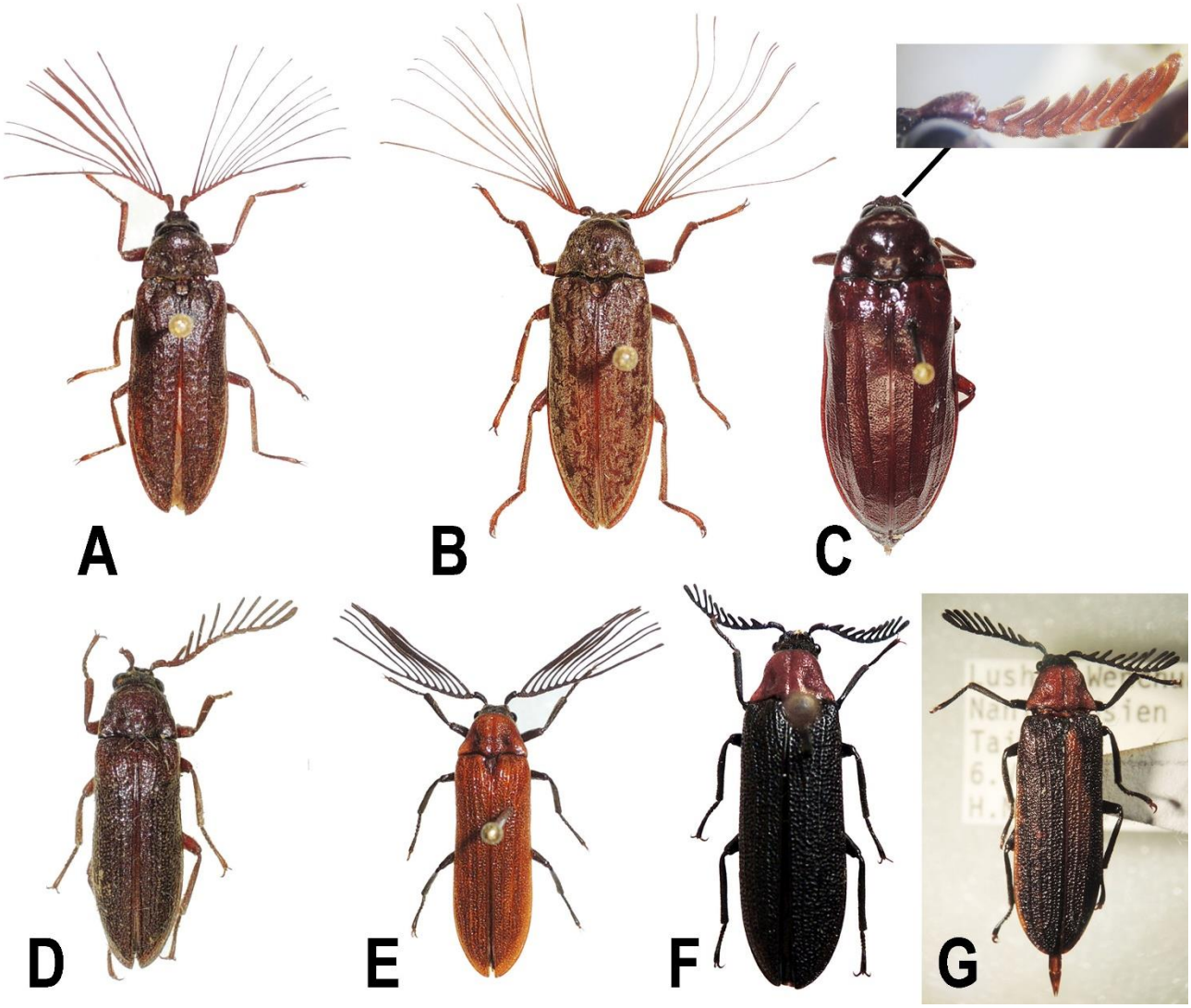
(圖一 E–G)

Simianellus melanocephalus Emden, 1924a: 33
Horatocera similis Miwa, 1928: 373.
Simianus melanocephalus: Hájek, 2011: 41.

標本檢查：1 ♀, Lushan Wenchuan, Nantou Hsien, 6. VI. 1976, H. Makihara leg. (KUM); 1 ♂, Lushan, Nantou Hsien, 8. VI. 1976, H. Makihara leg. (KUM); 2 ♂♂, Sungkang, Nantou, 24. V. 1998, C.-C. Lo leg. // NMNS ENT 4463-822; 4463-2043 (NMNS); 1 ♂, Shuisheta Mt., Yuchih, Nantou, 28. IV. 2007, By hand, Liu, Chang, Chen, Yau & Chan leg. // NMNS ENT 6455-25 (NMNS); 1 ♀, Heping, Taichung, 18. VI. 2012, Y. Hsiao leg. (YHC); 1 ♂, Tienchi, Kaohsiung, 8. V. 2013, W.-C. Liao leg.

(YHC); 1 ♀, Guandaoshan, Puli, Nantou, 21. VI. 2015, C.-H. Wu leg. (CHC); 1 ♀, Shanlinchih, Nantou, 26. VI. 2017, Diurnal, U. Ong leg. (UOC).

短註：本種雌蟲體色變化極大，Osawa et al. (1994) 則記錄了有 (橙色前胸背板 + 黑色翅鞘，圖一 F) 和 (黑色前胸背板+ 橙色翅鞘) 的雌性個體，本次則新發現了橙色前胸背板 + 黑色翅鞘，但黑色翅鞘部分混雜橙色色塊 (圖一 G)，以及橙色前胸背板 + 橙色翅鞘的色型。Osawa 等人雖推測黑色前胸背板+ 黑色翅鞘的雌性個體存在的可能性，然而至今卻尚未有紀錄此色彩型。



圖一、臺灣產細櫛角蟲科 (Callirhipidae)，背面照：A. *Callirhipis* (*Callirhipis*) *formosana* Pic, 1912 蓬萊細櫛角蟲，雄性 (18 mm)；B–C. *C.* (*C.*) *kojimai* Nakane, 1996 大細櫛角蟲，B. 雄性 (20 mm)，C. 雌性 (27 mm)；D. *C.* (*Ennometidium*) *horni* (Emden, 1924) 霍氏恩細櫛角蟲，D. 雄性 (14 mm)；E–G. *Simianus melanocephalus* (Emden, 1924) 橙細櫛角蟲，E. 雄性 (14 mm)，F. 雌性 (18 mm)，G. 翅鞘為橙黑色塊混雜之色彩型。

臺灣產細櫛角蟲科雄蟲種級檢索表
A Key to Males of Callirhipid Cedar Beetles in Taiwan

1. 前胸背板和翅鞘為橙色 (圖一 E)。
Pronotum and elytra orange……..……..…..... 橙細櫛角蟲 *Simianus melanocephalus*

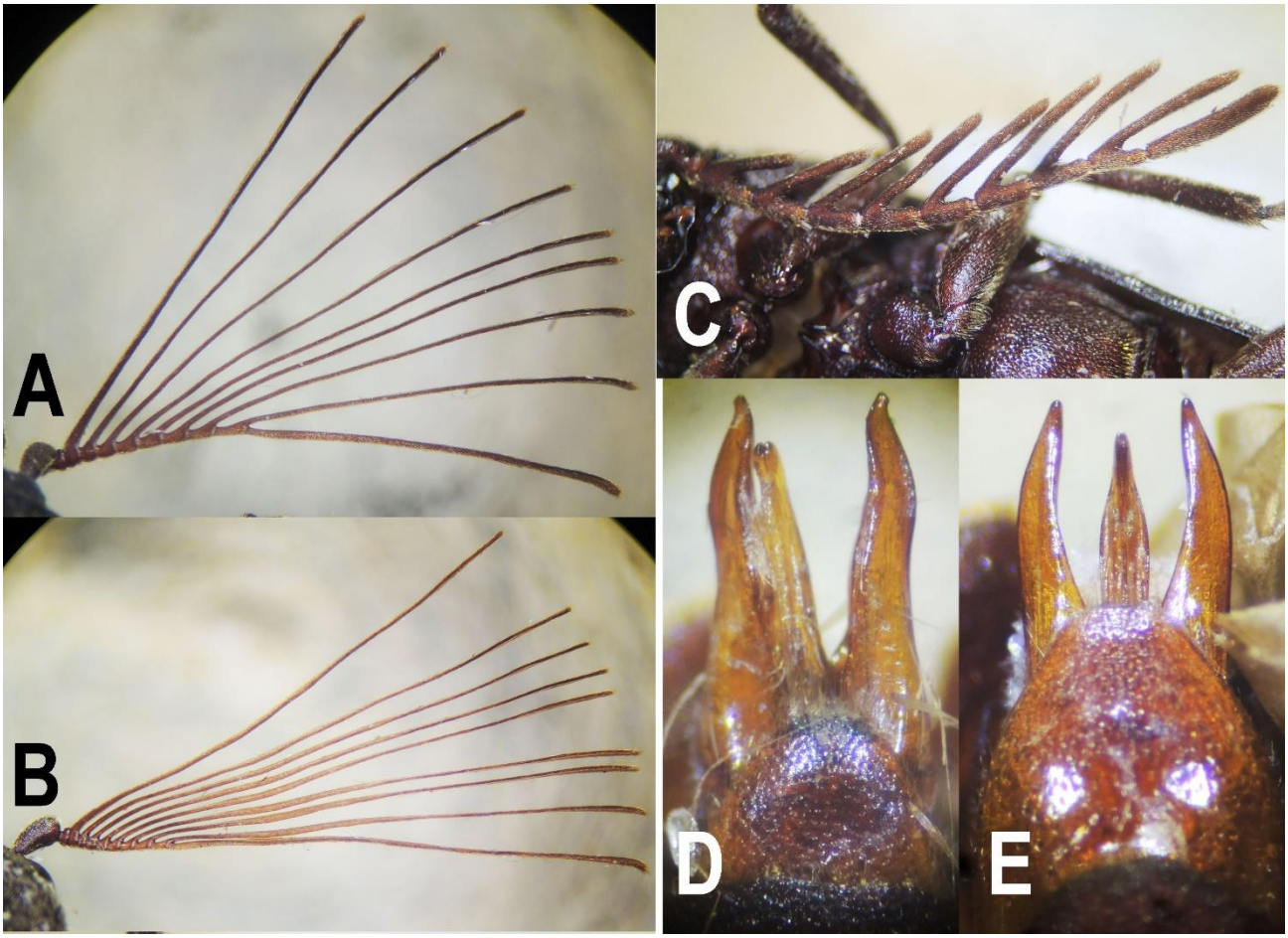
前胸背板和翅鞘為褐色到黑色 (圖一 A–D)。
Pronotum and elytra brown to black……..……..…… 2

2. 觸角櫛齒約為觸角小節的 3 倍長度 (圖二 C)。
Pectinate projections of antennae ca. 3X the length of antennomeres..…..... 霍氏恩細櫛角蟲 *Callirhipis* (*Ennometidium*) *horni*

觸角櫛齒約為觸角小節的 24 倍長度 (圖二 A–B)。
Pectinate projections of antennae ca. 24X the length of antennomeres…….... 3

3. 體型較小，15–18 mm ，陽莖側葉呈波浪狀 (圖二 D)，分布：臺灣本島。
Smaller, with length 15–18 mm; parameres sinuate; Taiwan...……..…..... 蓬萊細櫛角蟲 *Callirhipis* (*Callirhipis*) *formosana*

體型較大，17–25 mm (多在 20 mm 以上)，陽莖側葉線性地向內彎曲 (圖二 E)，分布：蘭嶼島、臺灣本島 (存疑)。
Larger, with length 17–25 mm (mostly ≧20); parameres lineally curved inwards; Lanyu (Orchid Island) and Taiwan (?)..... 大細櫛角蟲 *Callirhipis* (*Callirhipis*) *kojimai*



圖二、臺灣產細櫛角蟲科 (Callirhipidae) 雄性鑑定特徵：A–C. 觸角；D–E. 外性器。A, D. *Callirhipis* (*Callirhipis*) *formosana* Pic, 1912 蓬萊細櫛角蟲；B, E. *C.* (*C.*) *kojimai* Nakane, 1996 大細櫛角蟲；C. *C.* (*Ennometidium*) *horni* (Emden, 1924) 霍氏恩細櫛角蟲。

討論

細櫛角蟲科科級中文俗名

目前臺灣地區對 Callirhipidae 所使用的科級中文俗名有櫛角蟲科 (e.g., The Digital Museum of Nature & Culture, 2011–2012; Taiwan Catalogue of Life, 2018) 和細櫛角蟲科 (e.g., The Entomological Society of the Republic of China, 1994; Chang, 1998) 並行使用，其中櫛角蟲的中文科級俗名可追溯至三輪勇四郎 (Miwa) 於 1920s–1930s 的著作 (Miwa, 1928, 1938)，雖然 Miwa (1938) 文中提到細櫛角蟲科的 *Horatocera niponica* Lewis, 1895，但當時仍普遍將細櫛角蟲與蟬寄甲視為同一個科 (i.e. Rhipiceridae)，可見這個譯名起初是用來指稱蟬寄甲而非細櫛角蟲類，而這個中文俗名也同樣使用於 1994 年中華昆蟲學會 (今台灣昆蟲學會) 出版的昆蟲綱科以上學名中名對照表名錄 (The Entomological Society of the Republic of China, 1994) 。另外，Lee (2005)〈靠蟬長大的甲蟲：蟬寄甲〉可視為中國大陸地區使用蟬寄甲 (另一個大陸地區使用的中文俗名為羽角甲) 作為 Rhipiceridae 之中文俗名契機並已逐漸廣泛使用。同時，櫛角蟲一詞亦轉為指稱 Callirhipidae 並出現在國立自然科學博物館的科普線上資料庫 (The Digital Museum of Nature & Culture, 2011–2012)；另一方面，Callirhipidae 細櫛角蟲科早已出現於 1994 年中華昆蟲學會的昆蟲綱科以上學名中名對照表中，而 Chang (1998) 於其《昆蟲圖鑑》中亦依循這個用法。

雖然這兩個中名都為臺灣地區現行使用的俗名，且前者已被使用在線上科普資料庫及中研院臺灣物種名錄和生命大百科系統，然而考量到櫛角蟲科之名所使用的歷史脈絡，以及相關科系學生仍普遍使用 1994 年版昆蟲綱科級學名中名對照表，同時擁有新舊意義的櫛角蟲科一詞恐會造成認知和溝通上的混亂，此處建議未來應以細櫛角蟲及蟬寄甲科分別作為 Callirhipidae 及 Rhipiceridae 的中文科級俗名為佳。

大細櫛角蟲的學名錯誤拼寫和正模式產地問題

大細櫛角蟲 (*Callirhipis* (*Callirhipis*) *kojimai* Nakane, 1996) 為臺灣最大型的細櫛角蟲科成員，是蘭嶼島上常見的甲蟲之一，然而坊間所使用的學名存在兩個誤植的版本，其一為 Chang (1998) 於書中所提到的 *C.* (*C.*) *antiqua* Waterhouse, 1877 (安蒂克大細櫛角蟲)，以及 Yang (2010) 於環境資訊中心網站上〈一隻紅螢頂著大鹿角〉一文所提到的 *C.* (*C.*) *miwai* Nakane, 1985 (三輪大細櫛角蟲)，然而前者為產於菲律賓產的種類，後者則分布於日本琉球石垣島和西表島，臺灣地區皆未有兩個物種可信的分布紀錄，透過雄蟲外性器的比較形態學，並根據 Satô (1995) 所隨附的黑澤細櫛角蟲 (*C.* (*C.*) *kurosawai* Satô, 1995) 和三輪細櫛角蟲雄蟲外性器圖繪及 Nakane (1996) 所提供大細櫛角蟲雄蟲生殖器圖繪，蘭嶼的細櫛角蟲屬物種應為 *C.* (*C.*) *kojimai* Nakane, 1996，因此，此處指正並呼籲大細櫛角蟲的正確學名拼寫。

另一方面，*Callirhipis* (*Callirhipis*) *kojimai* 係 Nakane (1996) 基於一隻雄性個體所發表的單模物種，模式標本產地為 Kending (墾丁)，由於本種常見於離島蘭嶼 (臺東縣蘭嶼鄉) 而未曾有在本島採集的紀錄，因此本種是否真實分布於臺灣本島成了謎團，是否為來自屏東墾丁的採集資訊有誤？還是當時指稱的 Kending 並非現在的墾丁？或者為潮流或颱風帶來的偶發性個體？抑或過去臺灣本島南端曾分布過大細櫛角蟲的族群？有關大細櫛角蟲的地理分布議題則有待後續的研究。

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本研究特謝捷克布拉格國家博物館昆蟲學系 Jiří Hájek 博士之意見交流和鑑定上協助和日本九州大學綜合博物館丸山宗利教授和九州大學農學部昆蟲學研究室辻尚道先生於筆者造訪時的諸多幫助，同時也致謝何彬宏先生 (國立中興大學昆蟲學系)、王惟正先生 (臺灣，臺南市)、胡芳碩先生 (臺灣，宜蘭縣)、吳之皓先生 (臺灣，臺東縣) 和廖文泉先生 (臺灣，臺南市) 提供研究樣本，此外感謝國立臺灣大學昆蟲學系昆蟲分類研究室和柯俊成教授提供實驗室設備和國立自然科學博物館取得之模式標本照片 (重建臺灣失落的昆蟲模式標本計畫，科技部編號 MOST101-2631-H-178-003) 和蔡經甫博士在作者擔任館內蒐藏助理期間給予的協助。

引用文獻

Böving, A.G. & Craighead, F.C. 1931. An illustrated synopsis of the principal larval forms of the order Coleoptera. *Entomologica Americana (new series)* 11 (1930): 1-351.

Chang, Y.-J. 1998. Illustrated book of insects. Yuan-Liou Publisher, Taipei, Taiwan. 367 pp. (in Chinese)

Crowson, R.A. 1950. The classification of the families of British Coleoptera. *The Entomologist's Monthly Magazine* 86: 149-171, 274-288, 327-344.

Crowson, R.A. 1955. The natural classification of the families of Coleoptera. Nathaniel Lloyd, London. 187 pp.

Digitization of Historic Museum Collections of Taiwan Deposited in Foreign Countries, 2011. Available from: http://dhmct.digital.ntu.edu.tw/chv.htm (accessed 17 June 2018). (in Chinese)

Emden, F. van. 1924a. H. Sauter's Formosa Ausbeute. Sandalidae. (Col.) (Zur Kenntnis der Sandalidae. I.). *Entomologische Mitteilungen* 13: 27-34.

Emden, F. van. 1924b. Zur Kenntnis der Sandalidae. II. u. III. *Entomologische Blätter* 20: 86-99

Emden, F. van. 1926. Die Sandalidae (Col.) des Zoologischen Staatsinstituts und Zoologischen Museum zu Hamburg. (Zur Kenntnis der Sandalidae IV). *Mitteilungen aus dem Zoologischen Staatsinstitut und Zoologischen Museum in Hamburg* 42: 30-36, pl. II.

Emden, F. van. 1929. Die geographische Verbreitung der Sandalidae, pp 115-121. In: Emden F van, Horn W (eds). 3. Wanderversammlung Deutscher Entomologen in Giessen (22.-26. V. 1929). Berlin-Dahlem. 152 pp.

Forbes, T.M. 1926. The wings folding patterns of the Coleoptera. *Journal of the New York Entomological Society* 34: 42-68, 91-137.

Hájek, J. 2011. World catalogue of the family Callirhipidae (Coleoptera: Elateriformia), with nomenclatural notes. *Zootaxa* 2914: 1-66.

Latreille, P.A. 1829. Crustacés, arachnides et partie des insectes. In: Cuvier, G. de Le Règne animal distribué d'après son organisation, pour servir de base à l'histoire naturelle des animaux et d'introduction à l'anatomie comparée. Nouvelle édition, revue et augmentée. Tome IV. Déterville – Crochard, Paris. XXVII + 584 pp.

Latreille, P.A. 1834. Distribution méthodique et naturelle des genres de diverses tribus d'Insectes Coléoptères, de la famille des Serricornes. *Annales de la Société Entomologique de France* 3: 113-170.

Lawrence, J.F. 2005. 18.12. Callirhipidae Emden, 1924. pp 551-555. In: Beutel RG, Leschen RAB (volume eds). Coleoptera, Beetles. Volume 1: Morphology and systematics (Archostemata, Adephaga, Myxophaga, Polyphaga partim.). In: Kristensen NP, Beutel RG (eds). Handbook of zoology. A natural history of the phyla of the animal kingdom. Volume IV. Arthropoda: Insecta. Part 38. Walter de Gruyter, Berlin – New York. XI + 567 pp.

Lee, C.-F. 2005. Cicada parasite beetles: the beetles develop relying on cicadas. *Nature* 89: 52-55. (in Chinese)

Miwa, Y. 1928. On the Rhipiceridae of Japan. *Transactions of the Natural History Society of Formosa* 18: 371-376. (in Japanese)

Miwa, Y. 1933. An Enumeration of Coleoptera from the Island Iriomote in Loochoo, with descriptions of new species. *Transactions of the Natural History Society of Formosa* 23: 4-15. (in Japanese)

Miwa, Y. 1938. Nihon kōchū bunruigaku. Nishigahara Kankōkai, Tokyo, Japan. 40 pp. (in Japanese)

Nakane, T. (1996) The beetles collected by Drs. Keizo Kojima and Shingo Nakamura in Taiwan (Insecta, Coleoptera) 2. *Miscellaneous Reports of the Hiwa Museum for Natural History* 34: 129-140.

Osawa, S., Nakane, T. & Yu, Ch. 1994. Color-polymorphism of *Horatocera similis* Miwa from Taiwan, with notes on *H. niponica* Lewis from Japan (Coleoptera, Callirhipidae). *Entomological Review of Japan* 49: 29-32.

Pic, M. 1912. Coléoptères exotiques nouveaux ou peu connus. *L'Échange, Revue Linnéenne* 28: 5-6.

Satô, M. 1995. Notes on the genus *Callirhipis* (Coleoptera, Callirhipidae) from the Ryukyu Islands and Taiwan. *Elytra, Tokyo* 23 (1): 17-23.

Taiwan Catalogue of Life, 2018. Available from: http://taibnet.sinica.edu.tw/ (accessed 17 June 2018).

The Digital Museum of Nature & Culture, 2011–2012. *Simianus melanocephalus* (van Emden, 1924). Available from: http://digimuse.nmns.edu.tw/da/collections/az/i0/ku/ (accessed 17 June 2018).

The Entomological Society of the Republic of China, 1994. The Name-list of Insecta (above Family Level) with Chinese Common Name. The Entomological Society of the Republic of China, Taipei, Taiwan. 40 pp. (in Chinese)

Yang, C.-W. 2010. A net-winged beetle with large antlers. Taiwan Environmental information Center. Available from: http://e-info.org.tw/node/52782 (accessed 17 June 2018). (in Chinese)

Zhang, S.-Q., Che, L.-H., Li, Y., Liang, D., Pang, H., Ślipiński, A., Zhang, P. 2018. Evolutionary history of Coleoptera revealed by extensive sampling of genes and species. *Nature Communications* 9: 205.

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A Review of the Family Callirhipidae in Taiwan (Coleoptera: Byrrhoidea)

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Abstract. The present study reviews the fauna of Callirhipidae Emden, 1924 in Taiwan, with comments on the Chinese common name of the family and a key to the identification of species. Additionally, the article also discusses the misidentification of the *Callirrhipis* species in Lanyu and its doubtful label data of the holotype.

Key words: Callirhipid cedar beetles, key, Chinese common names, misidentification, fauna of Taiwan

[研究文章 Research Article]

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Preliminary Report on Unnoticed Establishment of *Pheidole parva* Mayr Complex (Insecta: Hymenoptera: Formicidae: Myrmicinae) in the Ogasawara Islands: a Potential Risk to Native Ground-dwelling Invertebrates

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Abstract. An unnoticed establishment of *Pheidole parva* complex (Hymenoptera: Formicidae) to Chichi-jima Island of the Ogasawara Islands, which were nominated as a UNESCO Natural World Heritage Site, was recognized in 2007. Furthermore, *P. megacephala*, a famous invasive ant species, has also been highly prevalent in Chichi-jima Island in recent years. Since the majority of *Pheidole* spp. are generalist foragers, *P. parva* complex may has a potential risk to native ground-dwelling invertebrates in natural/seminatural forests of the Ogasawara Islands. Therefore, we conducted a survey of ants' distribution as the basis for further foreseeable management. Current distribution and habitat preference of the two *Pheidole* species were surveyed in Chichi-jima, Ani-jima and Ototo-jima Islands of the Chichi-jima Island Group by Quadrat Sampling and Time-Unit sampling. *Pheidole parva* complex was widespread from the coastal area to the inland area in the three islands, and exhibited no clear habitat selection in the three islands. On the other hand, *P. megacephala* was absent in Ani-jima and Ototo-jima, but was frequently found in coastal lowland of Chichi-jima.

Key words: invasive, ant, Bonin islands, distribution

Introduction

Ants are dominant animal taxa in major terrestrial ecosystems, making up as much as 10% or more of the total animal biomass, and they play indispensable roles as keystone controllers of trophic webs and ecological engineers (Wilson, 2000). On the other hand, by accompanying with human activities, an increasing number of ant species have been introduced to regions and environments where they did not occur naturally; of the approximately 15,000 species of ants described from the world (Antwiki. org, 2018), 147 species have been recorded outside of their native distributional ranges (McGlynn, 1999). Some of them have been recognized as serious invasive species having negative impacts on natural ecosystems, and/or economic activities and public health (Lach & Hopper-Bùi, 2010). *Anoplolepis gracilipes*, *Linepithema humile*, *Pheidole megacephala*, *Solenopsis invicta* and *Wasmannia auropunctata* are most notorious invasive ant species, and included in the "100 of the worst invasive alien species" (Lowe et al., 2000). Furthermore, there are many alien species of which introductions and range expansions have been unnoticed or ignored (Heinze et al., 2006).

Pheidole parva Mayr complex sensu Eguchi et al. (2013) is one of ignored alien ant species. It has been increasingly recorded in various localities of the Indo-West Pacific region, and it has been occasionally found in green houses in European counties (Sarnat et al., 2015). It was collected in a variety of different habitats, from parks and gardens, to mangrove and coastal

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scrub, to degraded dry forest, littoral and mixed forest, and rainforest, in elevations between 1 and 445 m (Fischer & Fisher, 2013). Discoveries of living workers onboard two different marine vessels at Barrow Island off Western Australia's coast indicates that the range has been expanded at least partly through human commerce (Eguchi et al., 2013). Although its negative impacts on natural ecosystems are unknown, it is one of the major ant species which frequently invade healthcare facilities in Singapore (Man & Lee, 2012), and thus it has a potential to become a nuisance pest (Sarnat et al., 2015). Eguchi et al. (2007) recognized introduction of *P. parva* complex to Chichi-jima Island of the Ogasawara Islands and to Okinawa Island of the Ryukyus which occurred before 2000 and 2001, respectively. Since that time it has been rapidly spread across the Ryukyus (Terayama et al., 2009; Yamane et al., 2014; Harada et al., 2015). A similar situation is probably going on in the Ogasawara Islands which were nominated as a UNESCO Natural World Heritage Site in 2011.

The Ogasawara Islands have been isolated since their formation and consequently have an extremely high proportion of endemic species, e.g., ca. 40% of the plants overall, 70% of trees only, ca. 30% of the insects and more than 90% of the land snails being endemic (Kato, 1992; Tomiyama, 1992; Shimizu, 2003). Proper management of invasive species is, therefore, one of the basic requirements for the nomination in the Natural World Heritage List. As a part of our long-term monitoring and risk evaluation programs on alien ant species in the Ogasawara Islands, we conducted a survey of the current distributions of *P. parva* complex and *P. megacephala* in Chichi-jima, Ani-jima and Ototo-jima Islands of the Chichi-jima Island Group. The latter is one of the most famous invasive ant species as mentioned above, and has been highly prevalent in Chichi-jima Island in recent years (Uchida et al., 2016). A preliminary report is herein presented in order to notice a potential risk of the unnoticed establishment of *P. parva* complex to native ground-dwelling invertebrates.

Material and methods

The characteristics of the studied islands are summarized as below by referring to Ministry of the Environment et al. (2010) and Kanto Regional Environment Office of Japan et al. (2010, 2014). Chichi-jima Island (23.45 km^2; 326 m; hereafter referred to as Chichi-jima) is inhabited and is the largest island of the Ogasawara Islands, and has a variety of habitats. Dense sclerophyllous scrubs, distributed from the Higashidaira and Mt. Chuosan region to the Yoakedaira and Nagasaki region, are important habitat for various threatened endemic plants and animals, and are important for conservation of biodiversity on Chichi-jima. Ani-jima Island (area: 7.87 km^2; highest elevation: 254 m; hereafter referred to as Ani-jima) under a dry climatic condition supports the largest sclerophyllous scrub forest (mainly *Distylio lepidoti-Pouterietum dubiae* and *Machilo kobu-Schimetum mertensianae* communities) among the Ogasawara Islands, as well as rocky desert plant communities, and has many threatened endemic plants, insects including the tiger beetle *Cicindela bonina* and snails. Ototo-jima Island (5.2 km^2; 235 m; hereafter referred to as Ototo-jima) is characterized with a moderately humid climate and relatively rich soil if compared to the other islands of the Chichi-jima Island Group, and the central part of the island is widely covered with mesic forests dominated by *Schima mertensiana*. Ani-jima and Ototo-jima are now uninhabited, but Ototo-jima was relatively intensively settled in late 19th and early 20th. The level of human-induced disturbance is relatively low in Ani-jima. Marginal areas of the two islands are largely covered with invasive *Casuarina equisetifolia* forests.

By referring to aerial photographs and land cover maps (mentioned below) and taking account of reasonable coverage of major habitat types, accessibility to the sampling locations and minimization of disturbances to the conservation areas, quadrats and sampling sites were set, and then spatial distribution of *P. parva* complex and its congener *P. megacephala* was surveyed by the following manners. A total of 443 quadrats (1 m x 1 m) were set along coastal lines and inland trails in Ani-jima, 155 quadrats in Ototo-jima, and 209 quadrats in Chichi-jima (hereafter referred to as "Quadrat Sampling"). In each quadrat the coordinates and elevation were recorded by a handy GPS receiver, and the habitat condition was briefly recorded. The target ant species were visually searched and collected within 2 subquadrats (0.3 m x 0.3 m) set in each quadrat. This "Quadrat Sampling" was conducted by T. Matsumoto from 18th to 21st June 2015, from 7th to 9th July 2015, from 9th to 16th September 2015, from 30th October to 3rd November 2015, from 3rd to 10th December 2015, and from 8th to 14th January 2016. Furthermore, a total of 86 sampling sites were set along roads and trails, and coastal lines in Chichi-jima. In each sampling site the coordinates and elevation were recorded by a handy GPS receiver, and then ant species (but not individuals) were collected as many as possible on the ground and lower vegetation up to approximately 1.5 m, within approximately 5m-radius from the GPS point, for ten minutes. This "Time-Unit Sampling" was conducted by H. Kobayashi or A. Yamamoto in Chichi-jima from 26th October to 10th November 2015, from 10th to 25th May 2016, from 18th to 27th August 2016, and from 27th October to 19th November 2016; the sampling was repeated in each sampling sites two to five times.

Ants were identified by referring to Terayama et al. (2014). Parts of the specimens identified as *Pheidole parva* complex and *Pheidole megacephala* were reexamined by Katsuyuki Eguchi, who is a taxonomist of Asian *Pheidole*, for confirming the identification. Voucher collection of the present study will be deposited in the collection of the Systematic Zoology Laboratory, Tokyo Metropolitan University.

Land cover map was obtained from the Ogasawara Islands Nature Information Center of the Ministry of the Environment, Japan (http://ogasawara-info.jp/specialist/gis/map_default.phtml; http://ogasawara-info.jp/pdf/isan/shokuseizu.pdf). Land cover types in the map are merged into three habitat types: natural/seminatural forest (the type I.1 in the map); disturbed forest (I.2, I.3 and I.4); open land (II and III). The most dominant habitat type within approximately 20m-radius from the GPS point was regarded as the habitat type of each of the quadrats or sampling sites. (Table 1)

Results and Discussions

Pheidole parva complex was found from 40 of 209 quadrats and 44 of 86 sampling sites in Chichi-jima, and from 130 of 443 quadrates in Ani-jima, from 60 of 155 quadrates in Ototo-jima. It was widespread from the coastal area to the inland area in the three islands (Figs. 1–3), and exhibited no clear habitat selection in the three islands, (Fig. 4; Table 1). On the other hand, *P. megacephala* was not found in Ani-jima and Ototo-jima, but found from 15 of 209 quadrats and 27 of 86 sampling sites in Chichi-jima (Figs. 1, 2). It was frequent in coastal lowland, and in open land and disturbed forest (Fig. 3; Table 1). The two *Pheidole* species coexisted only 2 of 209 quadrats and 2 of 86 sampling sites in Chichi-jima.

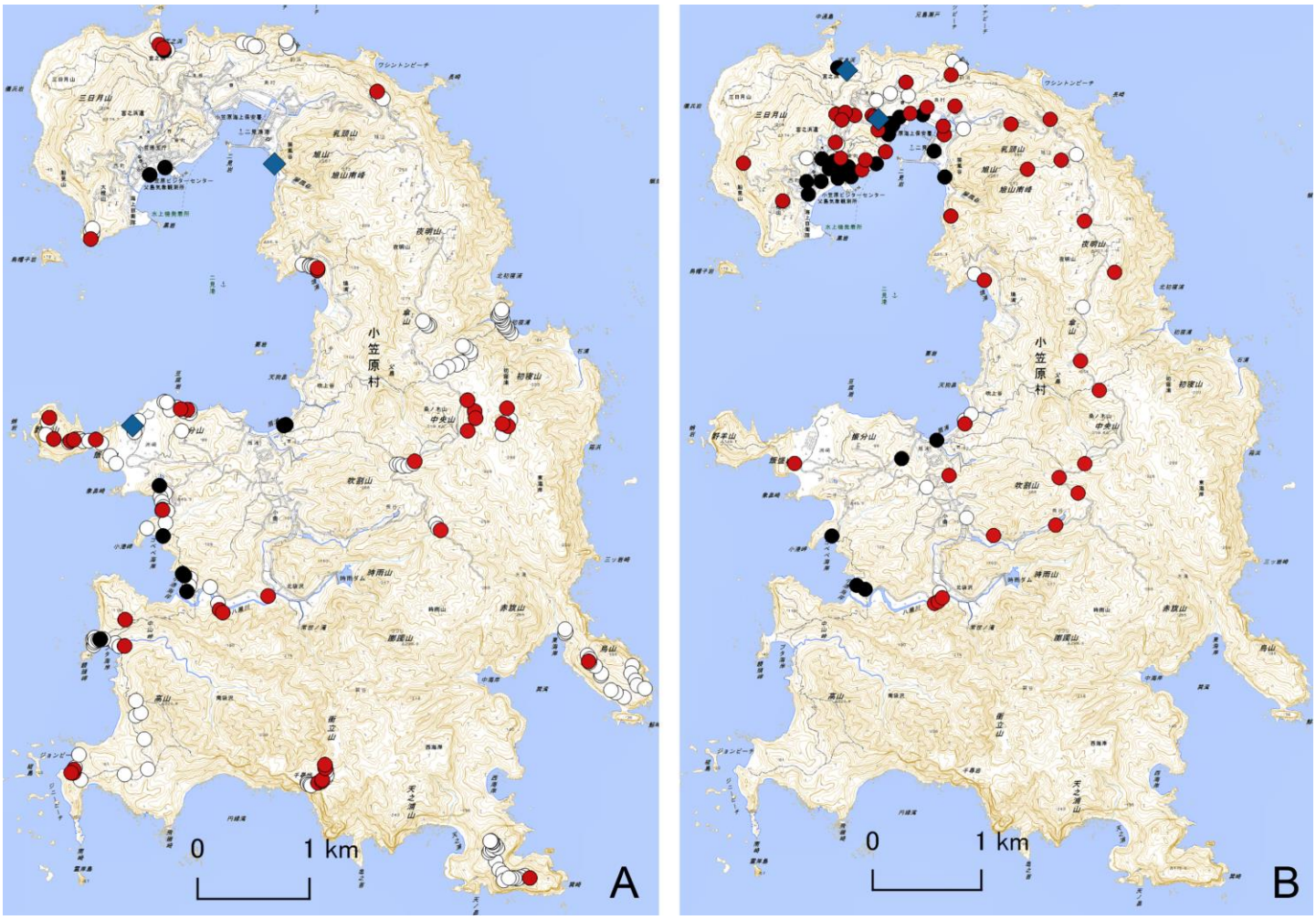

Figure 1. Distribution of *Pheidole parva* complex and *P. megacephala* in Chichi-jima based on Quadrat Sampling (A) and Time-Unit sampling (B) datasets. Red circle: presence of *P. parva* complex; black circle: presence of *P. megacephala*; blue diamond: presence of both the two *Pheidole* species; white cercle: absence of both the two *Pheidole* species.

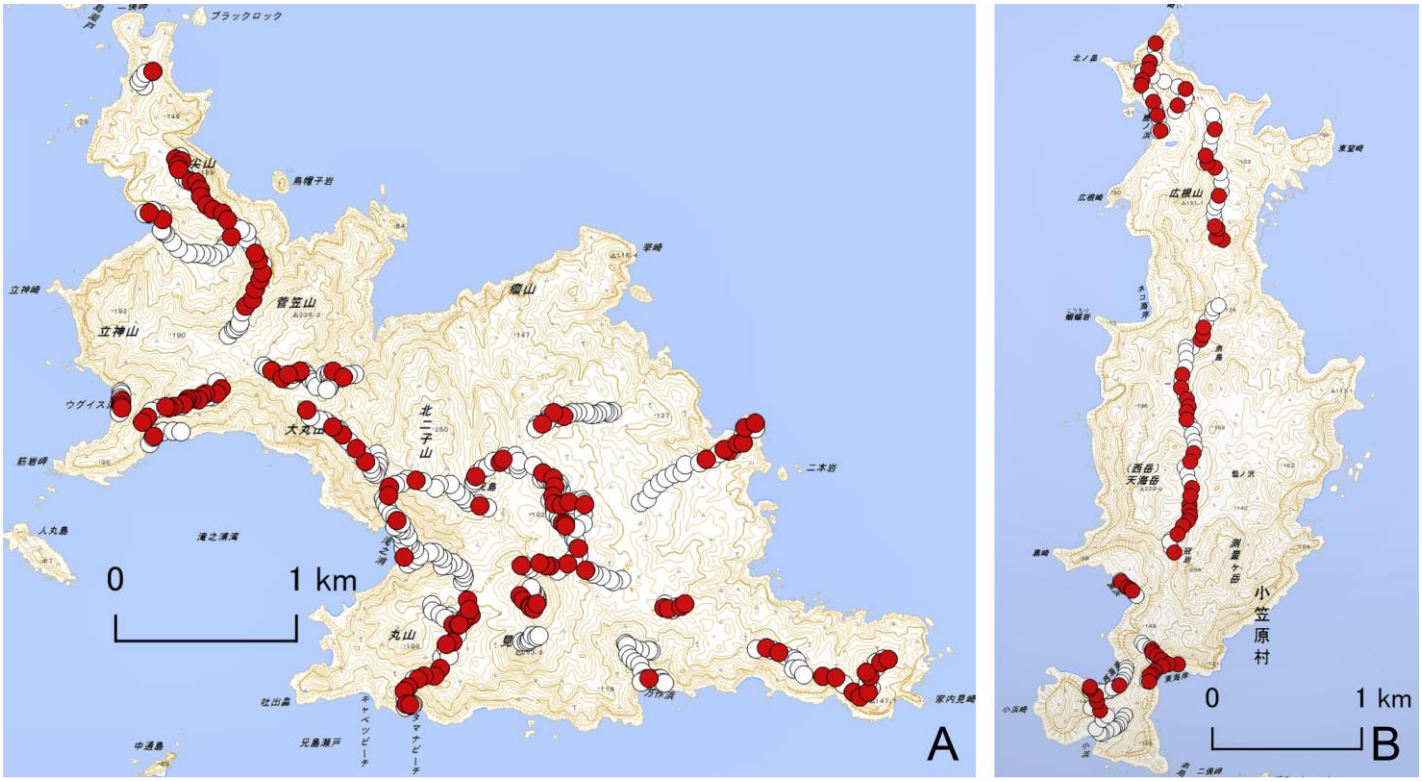

Figure 2. Distribution of *Pheidole parva* complex in Ani-jima (A) and Ototo-jima (B) based on Quadrat Sampling datasets.

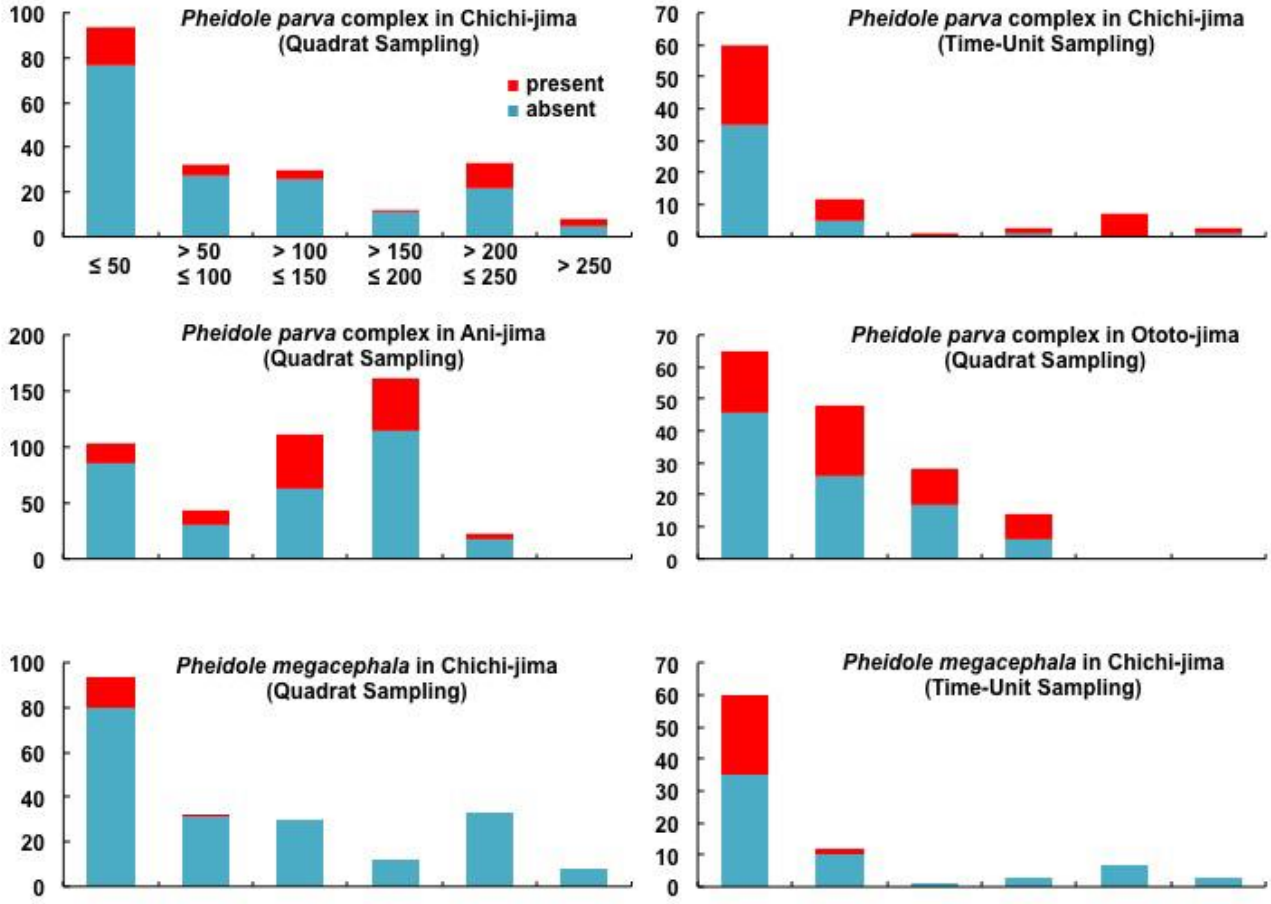

Figure 3. Vertical distribution of *Pheidole parva* complex and *P. megacephala* in Chichi-jima, Ani-jima and Ototo-jima. Vertical axis: number of quadrats or Time-Unit Sampling sites; horizontal axis: altitude (m).

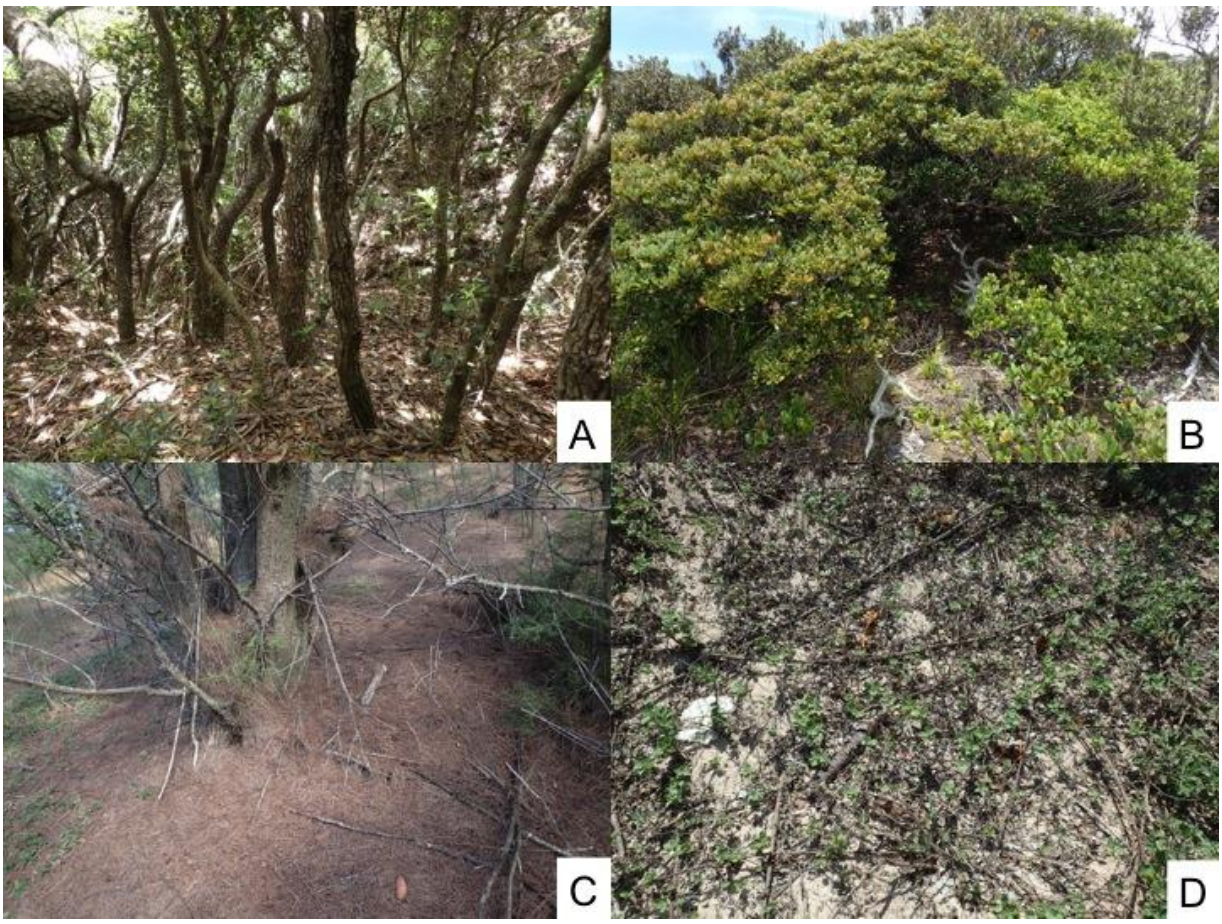

Figure 4. Habitats of *Pheidole parva* complex. A, *Schima mertensiana* forest, Quadrat AC5 in Chichi-jima; B, dwarf sclerophylious scrub, Quadrat AA11 in Ani-jima; C, *Casuarina equisetifolia* forest, Quadrat AO39 in Ototo-jima; D, sand beach dominated by *Vitex rotundifolia*, Quadrat AC109 in Chichi-jima.

Table 1. The occurrence frequency of *Pheidole parva* complex and *P. megacephala* in each land cover type. N/SF, the natural/seminatural forest; DF, disturbed forest; OL, open land; QD, Quadrat Sampling; TU, Time-Unit Sampling.

	N/SF	DF	OL
Pheidole parva complex			
Chichi-jima (QD)	19.7% (24/122)	16.7% (8/48)	20.5% (8/39)
Chichi-jima (TU)	76.2% (16/21)	61.5% (8/13)	38.5% (20/52)
Ani-jima (QD)	28% (77/275)	27.3% (3/11)	31.8% (50/157)
Ototo-jima (QD)	40.9% (27/66)	36.8% (7/19)	37.1% (26/70)
Pheidole megacephala			
Chichi-jima (QD)	3.3% (4/122)	6.3% (3/48)	20.5% (8/39)
Chichi-jima (TU)	9.5% (2/21)	15.4% (2/13)	44.2% (23/52)

Such habitat preference of *P. megacephala* has been reported in the other introduced areas; this is likely because open, disturbed habitats with weedy vegetation can support high densities of the honeydew-producing Hemiptera which is one of the important food sources for *P. megacephala* (Wetterer, 2007). On the other hand, *P. megacepala* invade some natural/seminatural

forests in Australia's monsoonal tropics, and is a serious potential threat to the region's rain forest invertebrate fauna (Hoffmann et al., 1999). Invasion of *P. megacephala* is limited by rainfall and rarely found in very dry (< 380–500 mm annual rainfall) or wet areas (> 2,500 mm annual rainfall) (Whetterer, 2007), and workers of *P. megacephala* are active outside the nest at temperatures of 24–30˚C, but not active at temperatures below 5˚C (Whetterer, 2007). The mean annual precipitation is 1,276.7 mm, and the mean temperature of the coldest month (February) and of the hottest month (August) is 17.7˚C and 27.6˚C, respectively, in Chichi-jima (Ministry of the Environment et al., 2010). Therefore, habitat and climate conditions may not prevent *P. megacephala* from expanding to the inland forests of Chichi-jima. Further studies will be needed to confirm the factors maintaining the allopatric existence of the two invasive *Pheidole* species in Chichi-jima.

P. parva complex has been established in Haha-jima Island (hereafter referred to as Haha-jima) (Eguchi et al., 2013), and introduction of *P. megacephala* to Haha-jima was recognized in early 2015 (Uchida et al., 2016). Because Haha-hima is one of the core areas for biodiversity conservation in the Ogasawara Islands (Ministry of the Environment et al., 2010; Kanto Regional Environment Office of Japan et al., 2010, 2014), the impact of *P. megacephala* on native ground-dwelling invertebrates such as endemic land snails is concerned (Uchida et al., 2016). It is worth noting that *P. parva* complex has a potential to dominate in inland area and natural/seminatural forests (Table 1). Although little is known about the biology of *P. parva* complex, the majority of *Pheidole* spp. are generalist foragers that prey on ground-dwelling invertebrates, scavenge on dead bodies of animals and feed on fruits and seeds (Sarnat et al., 2015). Therefore, *P. parva* complex has a potential risk to native ground-dwelling invertebrates in natural/seminatural forests of Haha-jima and other islands.

Dietary, foraging behavior, reproductive and dispersal strategies (independent or dependent colony foundation), colony structure (absence or presence of supercolony formation) and interactions with native and non-native species as well as detailed habitat preference should be revealed for evaluating the invasiveness of *P. parva* complex and setting it properly in the priority list of invasive species in the Ogasawara Islands.

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References

Eguchi, K., Yamane, Sk. & Zhou, S. 2007. Taxonomic revision of the *Pheidole rinae* Emery complex. Sociobiology 50 (1): 257-284.

Eguchi, K., Widmer, M., Oguri, E., Fischer, B.L. & Murakami, N. 2013. Discovery of cryptic species within Pheidole parva Mayr, 1865 (Insecta: Hymenoptera: Formicidae) widespread in the Indo-West Pacific. ARI – Journal of the Myrmecological Society of Japan 35: 16-27.

Fischer, G. & Fisher, B.L., 2013. A revision of *Pheidole* Westwood (Hymenoptera: Formicidae) in the islands of the Southwest Indian Ocean and designation of a neotype for the invasive *Pheidole megacephala*. Zootaxa 3683: 301-356.

Harada, Y., Enomoto, M., Nishimuta, K. & Minamata, H. 2015. Ants in Amami Islands. Nature of Kagoshima 41: 199-208.

Heinze, J., Cremer, S., Eckl, N. & Schrempf, A., 2006. Stealthy invaders: the biology of *Cardiocondyla* tramp ants. Insectes Sociaux 53: 1-7.

Hoffmann, B.D., Andersen, A.N. & Hill, G.J.E. 1999. Impact of an introduced ant on native rain forest invertebrates: *Pheidole megacephala* in monsoonal Australia. Oecologia 120 (4): 595-604.

Kato, M., 1992. List of insects in the Ogasawara Islands. WWFJ Science Report 1(Part 1): 73-105.

Kanto Regional Environment Office of Japan, Kanto Regional Forest Office, Tokyo Metropolitan Government, Ogasawara Village. 2010. Ogasawara Islands Ecosystem Conservation Action Plan (English translation for World Heritage nomination). Available from: http://ogasawara-info.jp/pdf/isan/ActionPlan_eigo.pdf

Kanto Regional Environment Office of Japan, Kanto Regional Forest Office, Tokyo Metropolitan Government, Ogasawara Village. 2014. Ogasawara Islands Ecosystem Conservation Action Plan 2. Available from: http://ogasawara-info.jp/pdf/isan/ActionPlan2_nihongo.pdf

Lach, L. & Hopper-Bùi, L.M. 2010. Consequences of ant invasions. pp. 261–286. In: Lach, L., Parr, C.L. Abbott, K.L. (eds.). Ant Ecology. Oxford University Press Inc., New York, xvii+402 pp.

Lowe, S., Browne, M., Boujelas, S. & De Poorter, M. 2000. 100 of the world's worst invasive species — a selection from the Global Invasive Species Database. IUCN/SSC Invasive Species Specialist Group, Auckland, New Zealand.

Man, L. S. & Lee, C.Y. 2012. Structure-invading pest ants in healthcare facilities in Singapore. Sociobiology 59 (1): 241-249.

McGlynn, T.P. 1999. The worldwide transfer of ants: geographical distribution and ecological invasion. Journal of Biogeography 26 (3): 535-548.

Ministry of the Environment, Forestry Agency, Agency for Cultural Affairs, Tokyo Metropolitan Government, Ogasawara Village. 2010. Ogasawara Islands Management Plan (English translation for World Heritage nomination). Available from: http://ogasawara-info.jp/pdf/isan/kanrikeikaku_eigo.pdf

Sarnat, E.M., Fischer, G., Guénard, B. & Economo, E.P. 2015. Introduced *Pheidole* of the world: taxonomy, biology and distribution. ZooKeys 543: 1-109.

Shimizu, Y. 2003. The nature of Ogasawara and its conservation. Global Environmental Research 7 (1): 3-14.

Terayama, M., Takamine, H. & Kubota, S. 2009. Ants of Okinawa. Seiinndo-Insatsu, Naha, Japan, xvi+165 pp.

Terayama, M., Kubota, S. & Eguchi, K. 2014. Encyclopedia of Japanese Ants. Asakura Syoten, Tokyo, 48+viii+278 pp.

Tomiyama, K. 1992. Terrestrial molluscan fauna of Ani-jima Island, the Ogasawara Islands and present situation of land mollusks of the site scheduled for the Ani-jima airstrip. WWFJ Science Report 1 (Part 1): 149-195.

Uchida, S., Mori, H., Kojima, T., Hayama, K., Sakairi, Y. & Chiba, S. 2016. Effects of an invasive ant on land snails in the Ogasawara Islands. Conservation Biology 30 (6): 1330-1337.

Wetterer, J.K. 2007. Biology and impacts of Pacific Island invasive species. 3. The African Big-Headed Ant, *Pheidole megacephala* (Hymenoptera: Formicidae). Pacific Science 61 (4): 437-456.

Wilson, E.O. 2000. Foreword. pp. xv-xvi. In: Agosti, D., Majer, J.D., Alonso, L.E. Schultz, T.R. (eds.). Ants: Standard Methods for Measuring and Monitoring Biodiversity. Smithsonian Institution Press, Washington & London, xix+280 pp.

Yamane, Sk. 2014. Species composition of ants and seasonal change in their activity level in disturbed areas of Naze, Amami-oshima, southern Japan (Hymenoptera: Formicidae). Nature of Kagoshima 40: 123-126.

原生地棲無脊椎動物的潛在風險——有關被忽視的小笠原群島褐大頭家蟻複合群之野外族群建立初探

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摘要: 鮮引人關注的褐大頭家蟻複合群 (*Pheidole parva* complex) (膜翅目：蟻科) 於 2007 年時被發現立足於名列世界自然遺產的小笠原群島之中的小島——父島。此外，知名的入侵性螞蟻——熱帶大頭家蟻 (*P. megacephala*)，近年來於父島亦非常普遍。而由於大頭家蟻屬大多物種為廣食性的覓食者，我們推測褐大頭家蟻複合群對小笠原群島的原生林/次生林的原生地棲無脊椎動物可能具有潛在風險，因此我們著手調查蟻群分布以為未來可能的防治工作提供基礎資料。我們以方形取樣法及時間單位取樣法調查父島群島中的父島、兄島、弟島的大頭家蟻屬 (*Pheidole*) 物種的分布狀況及棲地，並發現褐大頭家蟻複合群在三座島中從內陸到沿海地區非常普遍，且對棲地沒有明顯偏好性。另一方面，熱帶家蟻則沒有分布於兄島及弟島，在父島的沿海低地則頻繁可見。

關鍵詞: 入侵性、螞蟻、小笠原群島、分布

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臺灣新紀錄種小扁龍蝨短記 (鞘翅目：龍蝨科)

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摘要: 小扁龍蝨 *Copelatus minutissimus* J. Balfour-Browne, 1939 首次於臺灣發現的分布記錄。

關鍵詞: 龍蝨科、新紀錄、臺灣

前言

扁龍蝨屬 *Copelatus* Erichson, 1832 體型扁平並呈橢圓形，全世界共計超過 400 個已描述種 (Nilsson, 2017) ，臺灣則已知有 4 種扁龍蝨屬物種 (Nilsson et al., 1995)，棲息於河流及淺水環境 (Mori & Kitayama, 2002)，以小型水生動物及屍體為食。小扁龍蝨 *Copelatus minutissimus* J. Balfour-Browne, 1939 的模式產地為新加坡 (Balfour, 1939)， 日本於 1995 年報導此物種在西表島的分佈紀錄 (Satô, 1995)。

而第一作者於 2015 年在新竹地區的水稻田 (圖二) 採得扁龍蝨屬成蟲 2 隻，經形態比對鑑定後確認為小扁龍蝨。

材料與方法

本研究使用網竿長 20 公分搭配網框長 15 公分之 D 型撈網採集，所檢查之標本均為第一作者採集私人收藏 (HCC: H.C.Liu's private collection, Hsinchu, Taiwan)，形態種鑑定依據 Mori & Kitayama (2002)，標本以 Leica EZ4 解剖顯微鏡觀察，相片以 Canon PowerShot SX50 HS 類單眼相機拍攝，長度單位為毫米 (mm)。

結果

小扁龍蝨

***Copelatus minutissimus* J. Balfour-Browne, 1939**

(圖一)

Copelatus minutissimus J. Balfour-Browne, 1939:79

標本檢查：1♂1♀, TAIWAN: Zhudong, Hsinchu County., 31. VIII. 2015, H.C.Liu leg. (HCC).

診斷特徵：可以由以下方式區別其他東亞的扁龍蝨屬物種：體型細長，體長約為最大寬度的 2.45 倍；體色紅棕色；翅鞘基部橫條狀黃斑，具 6 條縱向溝紋。

習性：棲息於平原地區的靜止水域。

分布：臺灣 (新紀錄) 、日本 (西表島) 、韓國、印度、新加坡。(Balfour, 1939; Satô, 1995; Bang et al., 2009; Ghosh & Nilsson, 2012)

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圖一、小扁龍蝨 *Copelatus minutissimus* J. Balfour-Browne, 1939。成蟲背面觀。

圖二、小扁龍蝨的棲息環境

引用文獻

Bang, H-S., Han, M-S., Na, Y-E. & Kang, K-K. 2009. Biodiversity of fauna and flora in Korean paddy field. Marco symposium 2009 Challenges for agro-environmental research in Monsoon Asia. (Section: Biodiversity and Agro-ecosystem in Rice Paddy Landscape in Moonsoon Asia); 2009 Oct 6; Tsukuba: Japan.

Balfour-Browne, J. 1939. On *Copelatus* Er. and Leiopterus Steph.(Col. Dytiscidae) with descriptions of new species. *The Transactions of the Royal Entomological Society of London* 88: 57-88.

Ghosh, S.K. & Nilsson, A.N. 2012. Catalogue of the diving beetles of India and adjacent countries (Coleoptera: Dytiscidae). *Skorvnopparn, Su pplement* 3: 1-77.

Mori, M., & Kitayama, A. 2002.Dytiscoidea of Japan, re-vised ed. Bun-ichi Sogo Shuppan, Tokyo, Japan. 231 pp. (in Japanese)

Nilsson, A.N., Wewalka, G., Wang, L-J. & Satô, M. 1995. An annotated list of Dytiscidae (Coleoptera) recorded from Taiwan. *Beiträge zur Entomologie* 45: 357-374.

Nilsson, A.N. 2017. A World Catalogue of the Family Dytiscidae,or the Diving Beetles (Coleoptera, Adephaga). Version 31.I.2017, 304 pp. Available from: http://www.waterbeetles.eu/documents/W_CAT_Dytiscidae_2017.pdf (accessed 17 July 2018).

Satô, M. 1995. New record of *Copelatus minutissimus* (Coleoptera, Dytiscidae) from the Ryukyu Islands. *Elytra*, 23(1): 24

Taiwan Catalogue of Life, 2018. Available from: http://taibnet.sinica.edu.tw/ (accessed 17 July 2018).

Mitamura, T ., Hirasawa, K. & Yoshii, S. 2017. The handbook of Japanese aquatic insect volume 1 :coleoptera.bun-ichi Publisher, Tokyo, Japan.176 pp.(in Japanese)

New Records of *Copelatus minutissimus* J. Balfour-Browne, 1939 (Coleoptera: Dytiscidae) from Taiwan

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Abstract. This study firstly reported the occurrence of *Copelatus minutissimus* J. Balfour-Browne, 1939 from Taiwan.

Key words: Dytiscidae, new record, Taiwan

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